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EXAMINER

KANG, DONGHEE

ART UNIT PAPER NUMBER

2811

DATE MAILED: 08/08/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/082,318

Applicant(s)

IKEDA ET AL.

Examiner

Donghee Kang

Art Unit

2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED. (35 U.S.C. § 133)
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 February 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 12-30 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 21-29 is/are allowed.
- 6) ☒ Claim(s) 12, 15-20 and 30 is/are rejected.
- 7) ☒ Claim(s) 13 and 14 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 February 2002 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☒ Certified copies of the priority documents have been received in Application No. 09/342,065.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Priority

1. This application appears to be a division of Application No. 09/342,065, filed June 29, 1999. A later application for a distinct or independent invention, carved out of a pending application and disclosing and claiming only subject matter disclosed in an earlier or parent application is known as a divisional application or "division." The divisional application should set forth only that portion of the earlier disclosure which is germane to the invention as claimed in the divisional application.

2. Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119(a)-(d). The certified copy has been filed in parent Application No. 09/342,065, filed on June 29, 1999.

Information Disclosure Statement

3. Acknowledgment is made of receipt of applicant's Information Disclosure Statement (PTO-1449) filed February 26, 2002.

Drawings

4. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the phrase "*forming a cutting groove between adjacent two of the pressure transducers for separating the pressure transducer from each other*" in claim 30 must be shown or the feature(s) canceled from the claim(s).

The phrase "forming a fixed electrode in the first surface of said substrate;.....; forming a diaphragm layer made of a conductive material over said sacrificial layer" in claim 21 must be shown or the feature (s) cancelled from the claim (s).

No new matter should be entered.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

5. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required:

Antecedent basis for the claimed subject matter in claim 21 is required, namely:
the phrase "*forming a fixed electrode in the first surface of said substrate;.....; forming a diaphragm layer made of a conductive material over said sacrificial layer*" which is not disclosed in the description section of the specification. The disclosure only discloses forming a fixed electrode on the first surface of said substrate and forming a diaphragm layer made of a conductive material over said sacrificial layer.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 12, 15, 17, 20 & 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shimaoka et al. (JP 40-9257618) in view of Ferrari et al. (US 6,472,244).

Re Claim 12, Shimaoka et al. teach a method of manufacturing a pressure transducer comprising the steps of (Figs. 1-4).

preparing a substrate (30) having a first surface and a second surface opposed to the first surface; forming a fixed electrode (40) in the first surface of said substrate; forming a sacrificial layer (60, Fig.2) over said fixed electrode; forming a diaphragm layer (70) made of an insulating material over said sacrificial layer (see paragraph 0028 on attached translation); forming a hole which extends from said diaphragm layer; and injecting gases into said hole to remove said sacrificial layer to form a cavity so that diaphragm layer is deformed in response to an applied pressure.

Shimaoka et al. do not teach forming a hole which extends from the second surface of said substrate to said sacrificial layer. However, Ferrari et al. teach in Fig.10 forming a hole, which extends from the second surface of said substrate to said sacrificial layer and injecting gases into said hole to remove said sacrificial layer to form a cavity. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the hole, which extends from the second surface as taught by Ferrari in Shimaoka's device in order to prevent a reduction of the first area of wafer where the circuit integration is formed.

Re Claim 15, Shimaoka et al. teach the substrate is made of a semiconductor substrate having integrated circuit elements which form a detector designed to measure a capacitance between the fixed and moving electrodes.

Re Claim 17, Shimaoka et al. teaches said diaphragm is made from a compound of silicon and nitrogen (see paragraph 0028).

Re Claim 20, Shimaoka et al. teach said gas injecting step removes said sacrificial layer so as to leave a peripheral portion of said sacrificial layer.

Re Claim 30, Shimaoka et al. teach a method of manufacturing a pressure transducer comprising the steps of (Figs. 1-4).

preparing a substrate (30) having a first surface and a second surface opposed to the first surface; forming a fixed electrode (40) in the first surface of said substrate; forming a sacrificial layer (60, Fig.2) over said fixed electrode; forming a diaphragm layer (70) made of an insulating material over said sacrificial layer (see paragraph 0028 on attached translation); forming a hole which extends from said diaphragm layer; and injecting gases into said hole to remove said sacrificial layer to form a cavity so that diaphragm layer is deformed in response to an applied pressure.

Shimaoka et al. do not teach forming a hole which extends from the second surface of said substrate to said sacrificial layer. However, Ferrari et al. teach in Fig.10 forming a hole, which extends from the second surface of said substrate to said sacrificial layer and injecting gases into said hole to remove said sacrificial layer to form a cavity. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the hole, which extends from the second surface

as taught by Ferrari in Shimaoka's device in order to prevent a reduction of the first area of wafer where the circuit integration is formed.

Neither Shimaoka et al. nor Ferrari et al. teaches forming a cutting groove between adjacent two of the pressure transducers for separating. It is conventional in the art forming a plurality of device on a single wafer and separate from each other. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form a plurality of transducers on the single wafer and separate from each other in order to save time and manufacturing cost.

8. Claims **16 & 18** are rejected under 35 U.S.C. 103(a) as being unpatentable over Shimaoka et al. (JP 40-9257618) in view of Ferrari et al. (US 6,472,244) and further in view of Guckel et al. (US 5,357,807)

Shimaoka as modified by Ferrari teaches said diaphragm is made of an inorganic material but does not teach said sacrificial layer is made of an organic material. However, Guckel et al. teach in Fig.9 polyimide 53 is used for sacrificial layer which is removed later to form a cavity. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use polyimide instead of silicon oxide in Shimaoka's device as modified by Ferrari since polyimide can be easily formed than silicon oxide without using deposition technique such as CVD, hence saving a time and cost.

9. Claim **19** is rejected under 35 U.S.C. 103(a) as being unpatentable over Shimaoka et al. (JP 40-9257618) in view of Ferrari et al. (US 6,472,244) and further in view of S. Wolf (Silicon Processing for the VLSI Era, Vol.1, pp564).

None of cited prior arts teach said sacrificial layer is achieved in the dry etching using oxygen plasma. However, Wolf teaches that plasma containing oxygen produce species that attacks organic material to form CO , CO_2 and H_2O as end products. Such oxygen plasma provides a highly selective method for removing organic materials, since the O_2 plasmas do not etch Si. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use oxygen dry etch in Shimaoka as modified by Ferrari & Guckel since oxygen plasma provides a highly selective method for removing organic materials, since the O_2 plasmas do not etch Si.

Allowable Subject Matter

10. Claims 21-29 are allowed.

Claims 13-14 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for allowance and the indication of allowable subject matter:

Prior art reference, taken along or in combination, do not teach or render obvious that a method of manufacturing a pressure transducer comprising the step forming at least one waved portion on the first surface of said substrate.

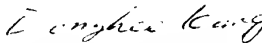
Prior art reference, taken along or in combination, do not teach or render obvious that a method of manufacturing a pressure transducer comprising the step forming a fixed electrode in the first surface of said substrate and forming a diaphragm layer made of a conductive material over a sacrificial layer.

Conclusion

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Donghee Kang whose telephone number is 703-305-9147. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 703-308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.


Donghee Kang
Examiner
Art Unit 2811

dhk
July 29, 2003